# ARCHITECTVRE

THE PROFESSIONAL ARCHITECTURAL MONTHLY

VOL. XXX NOVEMBER, 1914 No. 5

ARCHITECTURE. Edited by a Board of Architects in the interests of the profession, is published the fifteenth of every month by FORBES & COMPANY, LTD, (A. Holland Forbes, Prest.), 527 Fifth Avenue, New York.

PRICE, mailed flat to any address in the United States, Mexico or Cuba, $5.00 per annum, in advance; to Canada, $6.00 per annum; to any foreign address, $7.00 per annum.

ADVERTISING RATES upon request. The writing and displaying of Advertisements is an art in itself, and the publishers will be pleased to give the Advertiser the benefit of an Expert's experience in this line at no additional expense.

ENTERED at the New York Post Office as second-class mail matter.


PLATES AND ILLUSTRATIONS





# EDITORIAL

## THE SHREWD BUSINESS MAN WHO HAS STUDIED THE SITUATION SPENDS HIS MONEY IN ADVERTISING IN THE ARCHITECTURAL PRESS AND BECOMES WELL KNOWN. THE MAN WHO DOES NOT AND TRIES TO ADVERTISE THROUGH CIRCULARS AND FOLDERS GENERALLY SPENDS HIS MONEY WITH LITTLE RESULT

THE number of circulars which the architect receives in his daily mail is perfectly astounding, and when one considers the enormous amount of money spent annually on these circulars, one wonders is the "game worth the candle." There ought to be some way by which circulars could make themselves read, but the fact remains that more than half of them go into the waste paper basket without even being opened, and of the balance very few are looked at.

It seems almost impossible that the manufacturers who still use circulars have not given this matter considerable thought, but if they have the results have not been productive to an amount commensurate with the expense, and it may be doubted if, in the case of certain circular letters, any result whatsoever is obtained. The problem involved in the preparation of a circular is two-fold; first, it must somehow get itself read, and second, it must contain subject matter which will impress itself upon the architect's mind, for it cannot be hoped that the circular letter advertising a certain product will often reach the architect at the exact time when he is specifying such a product, and to produce results, the circular letter should make a lasting impression upon the reader. Frankly we think that most circular letters are both stupidly gotten up and stupidly written, and yet we are unable to say precisely where they might be improved, although it is easy to say where certain of them fail.

Novelty is unquestionably a factor in securing attention, but novelty without good taste will not get very far, since the business of the architect tends to make him discriminating in such matters, and the sort of advertising which apparently appeals to the country contractor fails to "get over" with the architect. Also the personality of the architect is not a fixed equation; it might perhaps be possible to indicate a type of circular letter which would appeal to the composite architect, and it certainly is possible to write a circular letter which would appeal to a limited number of the architects, but the problem is, of course, to find a method of writing which will attract the ultra refined without being condemned as flavorless by the "shirt sleeves" type.

One class of circular letters which may not be very beneficial, but which certainly are looked at, is the type which consists of a single neat engraved card enclosed in either a plain envelope, or an envelope with the firm's name and address (not business) in the corner. These announcements, if decently engraved and brief, are almost invariably looked at, and very many firms take advantage of every trivial change in their business to send out such cards, by repetition fixing the name of the concern in the memory of the reader. Announcements, for example, which run as follows:

Messrs. Smith and Webb
of
2222 X Street
take pleasure in announcing that
Mr. Henry R. Strong
formerly associated with the firm of
Russell and Jones
will on the first of October next
become manager of the lighting
branch of our business.

Such announcements as this of course may mean very little except to the few men who have had to deal with the salesman who has changed his position, but the firm who repeats announcements of this kind at rather frequent intervals on good stationery and in good style, will eventually be remembered, when circulars which contain much better matter, presented in an inferior manner, will have been completely forgotten.

One method of circular advertising which is by no means uncommon, and which to us at least is particularly repellent, is the hale-fellow-well-met style, which begins:—

"Dear Mr. Architect:—

I have a product which would be to our mutual advantage to know about. Come sit down for a minute and give this your attention, and I will tell you something which you want to know, and which will do you a lot of good, etc."

Circularizing of this kind is probably more apt to do harm than good; the architect is not unique in resenting the touch of patronage which letters of this kind convey, and he is apt to feel about the firm which sends him such a letter as he does about the salesman who can't keep his hands off his shoulders when he comes into the office. There may be some men to whom this sort of letter appeals, but there are not very many, and there are a great many letters which, if not couched in the exact terms here employed, are at least not very different in spirit. Such circular letters can be completely condemned.

Another class which would be very useful if it were read, is the very large class in which the subject matter consists almost entirely in presenting the results of fairly conducted tests, and the problem in this sort of letter is not so much to secure a proper impression upon the architect, as it is to get the architect to examine the tables carefully enough to make any impression at all. Certain literature of this type has been unquestionably useful, especially if the result of the test shows the material exploited to compare favorably with that of some standard product in the same field which every architect is in the habit of using. Such literature is as a rule not sufficiently condensed; the manufacturer forgets that a circular is not a catalogue, and that if an architect wants to go exhaustively into a subject he would hardly wish to obtain his entire knowledge of it from a circular issued by a single manufacturer. It is probably better to put too little rather than too much information into a circular of this kind, and unquestionably the conclusive results which in the manufacture's opinion should determine the selection of his product, should be thrust under the architect's nose the minute he opens the envelope, with the idea that he would be held spell bound with admiration.

A very excellent type of circular letter is one which is mainly a picture book, with descriptive text as brief as possible. A certain manufacturer of mantels has enormously increased his business by enclosing in every letter he sends out an illustration of a really excellent mantel, with the statement that it is a copy of some well known museum piece, or of an authentic old mantel. But all products do not readily lend themselves to this method of illustration, and several other firms whose products are uninteresting in appearance have used with success drawings, sometimes humorous and sometimes merely quaint, to attract the eye and focus the attention. One manufacturer about ten years ago, got out a series of leaflets, each one of which had some very delightfully drawn grotesque figures with the name of the concern on one side, and on the other a concise, clear and explicit account of some portion of the processes of manufacture. These leaflets were so excellent in drawing that their coming used to be quite an event in the architects' offices, and over and over again they were stuck up on the walls purely because of their humorous quality, but incidentally serving as constant reminders of the firm which sent them out. Advertising of this kind, however, must have two qualities to command success; it must be genuinely artistic, and likewise be appropriate to its purpose, and this appropriateness which acts as a link between the manufacturer and the architect, is a very elusive quality. Probably, however, the great bulk of circular letters are of the same type; mimeographed letters with the architect's name and address, type-written in, more or less successfully matching the body of the letter. They very frequently begin with some sugar-coated appreciation of the architect or of the architectural profession, which probably does not help since most architects are not only fully competent to appreciate themselves, but actually succeed in doing so more completely than any one else can. Following these few kind words there are a couple of paragraphs of assertion that the particular manufacturer who has written the letter is the best in the business, or if not the best, he is at least the cheapest, and the letter usually winds up with a list of buildings in which the manufacturer's materials have been used, and the names of the architects who have designed them. This list is very useful, but some better evidence is generally needed to convince an architect that a particular firm is the one he wishes to employ than the bare statement by that firm that such is the case. Good sound reasons which will appeal instantly should be given, and these reasons should be expressed in language which accords with the rules of English grammar.

One of the best letters of this type which has recently been sent out reads as follows:

"Dear Sir:

Until Messrs. Blank and Blank gave up their business we were employed by them as foremen of their upholstery and painting departments.

As the old firm did the very best of work, and as the work was done under our personal supervision, we feel that a satisfactory outcome to any contract awarded us would be assured. Furthermore, as our overhead

expense is very low, we can do more and better work for a given amount than the older firms.

We are not designers, but we are practical skilled mechanics and have learned through our long experience as foremen to follow sketches and instructions as to designs, materials and colors intelligently and without comment.

Trusting that you will pardon this intrusion on your time and that you will give us an opportunity to submit estimates whenever you need upholsterers or painters, we are

Yours very truly."

It may be worth while analyzing the letter a little to see why it is attractive. In the first place it is on reasonably good stationery; not extravagantly good, but simple and in good taste; in the second place the firm for which the writers formerly worked were well known and their foremen must have been skilled mechanics, but the paragraph which has pleased the writer immensely, and which is constituted to please every architect is "We are not designers, but we are practical skilled mechanics and have learned through our long experience as foremen to follow sketches and instructions as to designs, materials and colors intelligently and without comment."

Somehow the man who wrote this letter has gotten over his little story in exactly the way he wanted to; one feels that he would be safe in the hands of men of "long experience," and that he could get along well with a firm who were willing to follow instructions "intelligently and without comment."

This letter is open to the same objection as the rest of its class, in that the signature is type written, and it is evidently a circular letter, while the best way for this sort of letter to get itself read is to masquerade as a personal one, not that the word "personal" should be put on the outside of the envelope, as is frequently done by the manufacturers, even on letters which are not sealed, and have a one-cent stamp on the envelope. There is a line which can be sharply drawn between legitimate and illegitimate methods in endeavoring to have letters read, and one which states that it is personal when in fact it is completely the contrary is apt to be feebly resented rather than welcomed.

Some manufacturers in disguising the purpose of their letters have carried the matter pretty far; in many cases they have taken the trouble to have them addressed from France or England, which insures their being looked at, if only from curiosity, while others enclose them in envelopes resembling night letters or telegraphic despatches. This latter way seems to the writer a little tricky, and not apt to produce good feeling which is essential to the conduct of business, but if a firm has any foreign connection at all the mailing of circular letters from London or Paris is a justifiable expedient, and one which produces results.

Of course, an excellent device is bound in the end to attract attention, regardless of the manner in which it is presented, but the average product which is not an absolute novelty but is merely as good as any other made by a similar manufacturer, must depend for its use upon an agreeable familiarity with its name produced by magazine advertising, personal calls and circular letters.

Of the three, the circular letter is probably the cheapest and the least effective, but its efficiency could be frequently increased, as was indicated at the beginning of this criticism, by more intelligent methods of use. Broad sides folded up and placed in small envelopes, voluminous booklets and fresh near-personal letters are regarded as either a bore or as an impertinence and accomplish no good end.

If there can be any general conclusions drawn for circular letters which are applicable to the circularization of all materials, they are first, good stationery, a two cent stamp, and good typewriting; second, brevity; third a frank and courteous statement to the architects of the merits of the material. The architect should be approached by the manufacturer in a manner neither subservient nor condescending; some architects may think that they exist on a higher plane than the rest of the world, but so do some manufacturers, and the majority of both classes are respectable hard working men, with a living to make, which can be more easily done if both classes have a complete and fair knowledge of the work the other is doing. And the manufacturer should remember that while he is just as busy as the architect, the time employed in getting out circular letters is not spent by him personally, while such part of the architect's time as he desires to claim must be the personal time of the architect, or of his most expensive employee, the specification writer.

We have very often heard manufacturers complain that they spend much money endeavoring to instruct the architects in the merits of their particular material, or in the merits of the particular class of materials which they manufacture, only to find that their efforts, if read at all, are read by the Italian pickers on the garbage dumps, and there is a certain soreness in the minds of many manufacturers because folders are so treated even when prepared with considerable care, and embodying the results of valuable and expensive research that can hardly be learned in any other way by the architect. In feeling this way about the matter they forget that the average architect of even inconspicuous merit will receive thirty to fifty of these letters a day, which at a rough guess would run from twelve hundred to thirty thousand words, and while the architect knows unquestionably that there is something in this mass of letters that he ought to know about, he is unable to take the time to find out what it is.

Most architects realize that they know very little about the quality of the goods they specify except from experience, and they also know that very often they are using imperfect goods because they know of no better ones, and that their best way to learn of better goods is through advertising and circulars, but as circulars are now written and sent out, to gain this knowledge from them is almost an impossibility.

## HENRY CLAY FRICK RESIDENCE, NEW YORK CITY

THOMAS HASTINGS, ARCHITECT

THE most costly and sumptuous city residence in the United States has just been turned over to its owner, Mr. Henry Clay Frick. The building and grounds cover the block facing on Fifth Avenue between 70th and 71st Streets, New York, the former site of the Lenox Library.

The house is designed in the style of Modern Renaissance. The exterior presents three imposing street façades. The main building is three stories high but the third story is set back behind a balustrade which almost obscures it from view. The two wings are only two stories high,

tending to accentuate the broad horizontal lines—unusual but pleasing in a city house. The frontage on Central Park adds materially to the impression of dignity and formality. The north wing, with its columned loggia looking into the garden, contains the art gallery and Mr. Frick's office. The exquisite sculpture on this loggia is a feature of the exterior. The cornice and balustrade with its pierced panels, the carved panels over windows and the sculptured figures in the tympana at three corners are studied and worked out to minute detail. The rear, perhaps the finest exterior of all, faces into a court accessible by driveways from both side streets. The wrought iron fence on the Fifth Avenue side is delicately designed and was executed by the Wm. H. Jackson Co. The beautiful entrance gates are also of wrought iron after the same design and were made by Jno. Williams, Inc.

Throughout the building there have been introduced many new features of construction and equipment. All materials and workmanship were tested for highest efficiency and worth so that nothing short of perfection would enter into the building. The construction is fireproof. Over two hundred hollow steel doors were furnished by the Interior Metal Mfg. Co.

This handsome and remarkable residence, involving an expenditure of almost three million dollars, was erected in the space of eighteen months by the contractors, Cauldwell-Wingate Co.

# A COUNTRY ESTATE ON LONG ISLAND

JAMES BRITE ARCHITECT

COMPARATIVELY few architects are called upon to produce an estate of such magnitude and magnificence as the residence for Mr. Herbert Lee Pratt at Glen Cove, L. I., illustrated in this issue, of which Mr. James Brite is the architect.

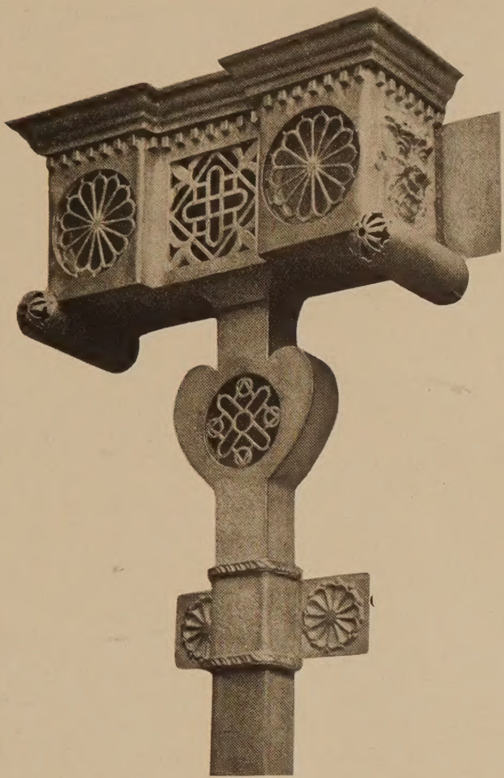
Mr. Pratt's taste and fancy dictated the employment of the Elizabethan style and while this is strongly felt throughout the development of the entire place, there can be traced the influence of and leaning toward Italian Renaissance expressive of the architect's preference for that style and his almost irresistible affection for it.

The setting for the house was not planned until after the building was designed and well under way, when Mr. James L. Greenleaf was called into consultation with Mr. Brite. Together, as architect and landscape architect, they co-operated in the design and construction of the gardens and grounds. After several schemes were set aside, it was finally decided to treat the grounds as an individual unit without consideration for adjacent properties. The house, facing East, is situated about midway across a rectangle 250 feet wide (the width of the house and pergolas) and 1,000 feet deep from the road to the sea wall on the Sound side. This formal setting is enclosed within a garden wall having a height of over eight feet at the road and gradually falling away to balustrade height where it meets the building. The main approach is through a set of beautiful wrought iron entrance gates, executed by John Burkhardt. The broad central avenue leads majestically and rigidly straight through the main forecourt to the minor forecourt directly in front of the house. No attempt has been made at elaborate planting in the forecourt. There are groupings of mature box trees near the house and at angles in the wall and some rows of fine maples on both sides of the drive. Further than this the idea has been to keep the grounds subservient the the dignity of the architecture of the façade.

The house is U-shaped, the body of Harvard brick with limestone trimmings furnished and cut by James McLaren & Sons. The roof line is characterized by the presence of many chimneys. Mr. Pratt wished to have a fireplace in every room, necessitating "windpipes of hospitalitie" in great profusion. At the south side of the house is the rose garden. To the North, and below the level of the front, is the service entrance. Facing the Sound is the formal garden, where the landscape effects are given full play. The space is divided into three levels of about equal area, with two drops of about eleven feet each, reached by ramps at the sides. The two upper terraces are again divided into three parts each. The central portion of the first terrace is a plain grass plot flanked on either side by box hedging and flower beds, back of which, in parallel lines about twelve feet apart, are tall cedars with grass alleys between. The cedar hedges and grass alleys are continued on the second terrace. The water garden occupies the middle portion of the second terrace. There are four pools around a central fountain, with a water base 23 feet in diameter. The bronze figures are a trifle over life size, supporting a basin of semi-polished Stony Creek granite. The third terrace, running to the garden wall, is an undivided area known as the Sport Terrace, where provision is made for out-door games, such as tennis, bowls, etc. Outside of the garden wall is a background, heavily wooded to the North and South with occasional openings, affording interesting vistas.

The basement floor is given over to service and equipment except that part used for bowling alley and swimming pool. The house contains nineteen bathrooms, four shower baths and swimming pool. The pool is constructed of ceramic tiles by the Wm. Jackson Co. Thirteen of the bathrooms are supplied with hot and cold fresh water and hot and cold salt water. The swimming pool may be so arranged that either fresh or salt water can be used. The salt water is piped in from several hundred feet in the Sound and filtered by a Loomis-Manning filter of special construction. The plumbing for the entire estate was carried out by John P. Blair. The heating plant furnishes indirect steam radiation for the formal rooms and direct steam radiation for the minor rooms. A refrigerating machine, with capacity for several tons of ice per day, provides refrigeration for the White Enamel boxes and cooled drinking water on each floor. Dreadnought flooring is used in the kitchen. There is an electric passenger elevator, service elevator, trunk lift and dumbwaiter running from basement to attic. The building is fireproof. All important window openings are fitted with Hope's metal casements and special devices. The Interior Metal Mfg. Co. equipped the windows with inside metal fire blinds, and built the hollow steel doors for elevators and stairs. Other doors are kalamein. The electrical equipment has been installed by Albin Gustafson Company.

The Main Entrance opens into a Gallery 125 feet long and 16 feet wide. The Gallery is paneled with modern



LEAD LEADER HEAD, COUNTRY HOUSE, HERBERT LEE PRATT.

oak extending up and including the staircases at each end and to the top of the house. The lighting fixtures are gilt and pewter designed in the spirit of the old work. Corridors run from the Gallery into the North and South wings. In the Halls and Corridors the oak paneling and sand-finish walls, in the character of the period, together with the ornamental plaster ceilings were modeled, carved and executed by L. Alavoine & Co., in their own ateliers. The rugs are made in Savonnerie quality, designs of which were copied from an old Chinese rug in the Metropolitan Museum. At the easterly end of the North corridor is the Billiard Room done by Arthur Todhunter. The room is paneled with imported old English oak in the Jacobean period. In the North wing is a secondary entrance known as the Guests Door near which are rooms for convenience of guests, intended solely for formal occasions. These coat and dressing rooms have tiled floors, gilt and pewter trim and mirrors.

Directly opposite, in the South wing is the Home Entrance. The family rooms are grouped in this wing and, while somewhat simple in comparison, they are very charming and interesting. Behind the Gallery, overlooking the garden and the Sound, are the Drawing Room, Living Room and Dining Room.

The Drawing Room, decorated by Alavoine, in the Georgian period, has a beautifully modeled plaster ceiling and cornice. The lighting fixture is gold and jade. The Savonnerie rug was designed from the Georgian period and made in a lavender shade, plain center with Georgian ornamental border in shades of lavender, the high lights harmonizing with the Caen stone walls, which tie the room together in a very pleasant manner.

It would be impossible to exaggerate the importance of the Elizabethan Living Room which was originally the Banqueting Hall of Rotherwas House, near Hereford, England. It was imported by Charles of London and reconstructed in the Pratt residence, including the floor and lighting fixture. The original old English oak planks, worm eaten and nail driven have been skilfully treated and laid by Hasbrouck Flooring Co. The ceiling was reproduced from the models of Rotherwas and the hardware is imported English make. This "Walnut Room," with its carved and polychromatically decorated chimney-piece and over-mantel, is the most precious and sumptuous of the eleven paneled rooms of Rotherwas. It is probably unique in completeness, preservation, beauty of workmanship, and also as regards the material used for the paneling, which is carried out in walnut instead of the customary oak wood, the marvelous chimney-piece alone being carved in oak. There is a certain Gothic character in the caryatides supporting the entablature, and in the ornamental motif, which are of an extraordinary varied nature, repetition being avoided as much as possible in the frieze, the pilasters, the mouldings and the arches. The "Walnut Room" is wonderful in its delicate workmanship, and has a finely carved mantel and over-mantel decorated in polychrome. This over-mantel bears four caryatid figures representing Justice, Fortitude, Temperance, Prudence, and in the center of the overmantel, twenty-five coats of arms in one achievement. The Dining Room is paneled to the ceiling with dark oak. It has a specially designed antique silver chandelier.

All the floors of the formal rooms are of wide oak planks, uniform in color and finish. The hardware is of English make, or of specially designed wrought iron by Yale and Towne Mfg. Co. Outside of the Dining Room and Living Room are open loggias overlooking the garden. The pergola extending north from the Dining Loggia ends in a children's play room. This is really a two-story play house, having a stairway to a room at the basement level. It is provided with separate housekeeping outfit. The Living Room Loggia has a pergola extending to the Tea Room. The terrace connecting the pergolas is enclosed with a stone balustrade.

On the second floor in the southwest corner, over the Living Loggia is Mr. Pratt's personal suite, including bedroom, dressing room, wardrobes and bath. On the west side are Mrs. Pratt's bedroom, boudoir, bathroom and outside sleeping porch. In the eastern end of the South wing and the easterly side of the main house are the children's apartments. Over the Dining Loggia and Dining Room is a suite consisting of two bedrooms, bath and sitting room for guests and visiting maid's or valet's room, as the case may be. At the easterly end of the North wing is a suite of isolated rooms with diet kitchen, etc. The South wing and the easterly portion of the main house on the third floor is exclusively for guests' suites. Lloyd's imported English papers are used for wall hangings. The westerly portion of the main house is given up to maid servant's rooms. The easterly portion of the North wing gives accommodation to men servants. The attic contains store rooms and mechanical equipment. The general contractor was Charles T. Wills, Inc.

At present the house is only partly furnished. The owner intends to let this be a matter of evolution. The furnishings will be carried out in keeping with the style and period of the house. It is this tone of graceful sincerity throughout that deserves admiration and approval for the unusually interesting country residence of Mr. Pratt.

# V. ENGINEERING FOR ARCHITECTS

BY DEWITT CLINTON POND

**Mr. Pond has charge of the practical course in structural design at Columbia University. He is extremely successful in instructing men who have had little knowledge of mathematics, and these articles have been written with that in view.**

THE design of columns involves some new considerations,—such as the determination of the radius of gyration—which seem complicated and confusing at first glance, but which are really simple if attacked intelligently. In the first article the value of S—the safe working stress for steel—was given as sixteen thousand pounds per square inch. This value was obtained by crushing cylinders of steel in testing machines, and finding the force necessary to fracture the metal. The average crushing value of steel has been found to be 64,000 pounds per square inch, and, as a factor of safety of four is always used with this metal the safe stress becomes 64,000÷4=16,000 pounds per square inch.

If columns of steel were short in proportion to their sectional area they would act in the same manner as the blocks of steel crushed in the testing machines, but this is never the case. Not only does a column tend to fail by crushing, but also by bending. No one really knows just how the combination of crushing and bending stresses affect the material in a column. Formulas have been derived in which every theoretical consideration seems to have been accounted for but these formulas have all had to be modified to agree with actual results obtained from experiments in which columns were subjected to crushing forces.

The first formula, of any kind, given in nearly every text-book on engineering is P=SA in which P equals the compressive load, S equals the safe unit stress and A equals the area. If P were to be taken as 300 tons, and S as 8 tons per square inch, then A must equal $\frac{300}{8}$=37.5 square inches as the area of a short block of steel supporting a load of 300 tons. If the block of steel were not short, but had a height comparatively great in relation to its sectional area, then it is obvious that S would become less, and in order to support the 300 tons, the area would have to be increased.

The general method of attacking a problem pertaining to the design of columns is to assume that a smaller value of S must be taken. Once S is established the load is divided by it, and the cross section area of the column is obtained. The real problem involved in column design is the determination of S.

The hand-book published by the Cambria Steel Company, gives a formula for S derived by Gordon. This formula gives the ultimate breaking strength per square inch of a column section as $\left\{\frac{50{,}000}{1+\frac{(12L^2)}{36{,}000\,r^2}}\right\}$ and if a factor of safety of 4 is used S becomes $\left\{\frac{12{,}500}{1+\frac{(12L)^2}{36{,}000\,r^2}}\right\}$ in which L is the length in feet and r is the "radius in gyration" in inches. Gordon's formula is the oldest and best known of all those used in modern practice and is found in the hand-books under the heading "Safe loads . . . for . . . Columns."

The formulas, giving S as required by the building laws of different cities, vary from Gordon's formula. The table of "Allowable Unit Stress and Loads" is not indexed but can be found in the 1909 edition of Cambria—on page 310. It gives S as required by the New York Building Code as $15{,}200-58\frac{l}{r}$ both l and r being measured in inches. This formula is much more simple than Gordon's.

To design a column to conform to the requirements of the New York Building Law, it is necessary to understand what l and r stand for. l is the length in inches of the unsupported length of the column, this distance usually being taken as the height from the top of the floor beam to the bottom of the floor beam directly above it. *r* is the *least radius of gyration* and this term needs some explaining.

As, in the second article, there was no definition of the moment of inertia given, the architect need not bother to find a definition of the least radius of gyration. The only important thing to remember is the formula $r^2=I/a$ in which *r* is the radius of gyration, I is the moment of inertia, and *a* is the area of the cross section. To find *r* it is necessary to first find I.

Take a problem in which it is necessary to design a plate and channel column, having a section strong enough to withstand a load of 300 tons, and having an unsupported length of fourteen feet. The first step is to assume a trial section.

It has been found that for heights from twelve to sixteen feet and average column sections, S is approximately 12,000 pounds or six tons per square inch. As the load (P) is 300 tons and S is 6 tons per square inch A must be 300÷6=50 square inches.

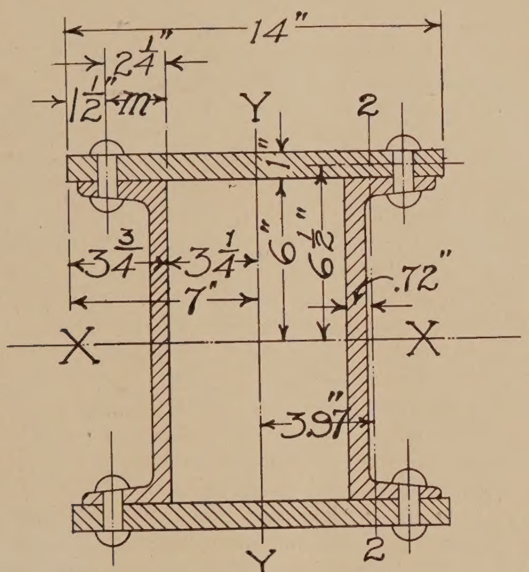
Assuming that the architect desires that the column shall not be more than fourteen inches in any direction, this limits the designer to the use of twelve inch channels and fourteen inch plates. Good design usually results from having as nearly equal areas in the plates and channels as possible To get an approximate area for each channel, divide 50 square inches by four and 12.5 square inches is the required area. A twelve inch channel, weighing forty pounds per foot, will have an area of 11.76 square inches. This is the largest twelve inch channel there is, and will have to be used in the design of the columns. Two channels will have an area of 23.52 square inches. 50.00—23.52=26.48 square inches to be made up of plates. There will be two sets of plates, each having an area of 26.48÷2=13.24 square inches. As the width of the plates is fourteen inches, the thickness must be 13.24÷14 which equals roughly one inch. The *trial section* then will be composed of two twelve inch, forty pound channels and two fourteen by one-inch plates.

In order to find the moment of inertia of this section, the location of the channels and plates with relation to the centre lines must be established. Under the heading "Standard Spacing of Rivet and Bolt Holes" in the handbooks, the distance "*m*" from the back of the channel to the centre line of the rivet hole in the flange is given for nearly all sizes of channels. The distance for a twelve-inch forty-pound channel is 2¼". In the fabrication of a column the distance from the edge of the plate to the centre of the rivet hole is usually one-inch and a half. This makes the distance from the edge of the plate to the back of the chan-

nel $2\frac{1}{4}''+1\frac{1}{2}''=3\frac{3}{4}''$ (Fig. 32). The plate, being fourteen inches wide, the distance from the edge to the centre is seven inches and the distance from the back of the channel to the centre will be $7''-3\frac{3}{4}''=3\frac{1}{4}''$.

The moment of inertia of the section shown in figure thirty-two around axis XX will be different from that around YY, and it will be necessary to find both.

In the hand-books, under the heading of "Properties of Standard Channels" the channels are shown to have one axis marked 1-1 and another marked 2-2. I, for axis 1-1, of a twelve-inch, forty-pound channel is found to be 196.9. For two channels this moment of inertia is 393.8. To find the moment of inertia of the column section, the I for the plates around XX must be found and added to that of the channels to give the *total* moment of inertia. In order to find this, the formula $I=I'+ah^2$ must be used. $I'$ equals the moment of inertia of the plates, $a$ equals their area, and $h$ equals the distance from the axis $XX$ to their centre of gravity. In figure 32 $h$ is found to be $6''+\frac{1}{2}''=6\frac{1}{2}''$. $a$ equals $14''\times1''=14$ square inches. The only other factor




FIGVRE 32

to be found is $I'$ and this is determined by the formula $I=\frac{1}{12}\times bd^3$. $b=14''$, $d=1''$, so $I\times\frac{1}{12}\times14\times1\times1\times I=1.16$. The moment of inertia of the plates around XX is given as $I=1.16+(14\times6\frac{1}{2}\times6\frac{1}{2})=1.16+591.5=592.6$. As 1.16, or $I'$, is such a small quantity in relation to 591.5, it is often disregarded by engineers. There are two sets of plates, so the moment of inertia of the two sets will be $592.6\times2=1185.2$. Add this to the I of the two channels and the total I for the section will be $I=393+1152=1545$.

To find the moment of inertia around YY, the same method is employed. The I of one set of plates is given, as before, by the formula $I=\frac{1}{12}\times bd^3$, only, in this case, $b=1''$ and $d=14''$. $I=\frac{1}{12}\times1\times14\times14\times14=229$. Two sets of plates will have a moment of inertia of 458. The I for the channels will be determined by the formula $I=I'+ah^2$. In the tables $I'$ for a twelve-inch, forty-pound channel, around axis 2-2 is 6.63. The area of each channel is 11.76. $h$ is the distance from axis 2-2 to the centre line YY. The distance from 2-2 to the back of the channel is given in the hand book is .72". We have found that the distance from the back of the channel to the centre is 3.25 inches, so the distance from YY to 2-2 is $3.25''+.72=3.97$ inches. To find the I of each channel around YY, simply substitute in the formula $I=6.63+11.76\times3.97\times3.97=192$. Two channels will have a moment of inertia of 384 and this, added to the I of the plates, will give $384+458=842$.

The two moments of inertia are 1545 and 842. If one had equaled the other, the design would have been better, but the architectural requirements make this impossible and the column will have a greater tendency to fail around axis YY than around XX.

The only reason for finding I for the section is for the purpose of determining the least radius of gyration. As the area of the section also enters into the calculation this must be determined. The channels have together an area of 23.52 square inches, and the two sets of plates will have an area of 28 square inches, making a total area of 51.52 square inches. As $r^2=\frac{I}{a}$, $r^2=16.4$, and r equals the square root of this or 4.05.

This value, 4.05, is the least radius of gyration and can be used to find the value of S in connection with the above problem. $S=15{,}200-58\frac{l}{r}$ or $15{,}200-58\times14\times12\div4.05=12{,}800$ pounds per square inch approximately.

As the area of the section is 51.5 square inches, and the allowable bearing value for the section is 12,800 pounds per square inch, this gives the total strength of the columns as $12{,}800\times51.5=659{,}200$ pounds or about 330 tons. This is too large, and a reduction in the area of the column section must be made. Instead of using one inch plates, seven-eighth inch plates can be made use of.

As a check for this again find the moment of inertia around YY. The channels will give the same I as before—384—and, looking in the hand-books under the heading of "Moments of Inertia—Tables" the I for a plate $14''\times\frac{7}{8}''$ is found to be 200.08. Two plates will have an I of 400.16. The total I for the section is $384+400=784$. The area is $23.52+24.50=48$ square inches—roughly—and $r^2=\frac{784}{48}=16.3$, $r=4.03$. $S=12{,}776$ and the strength of the section is $12{,}776\times48=613{,}248$ pounds or 307 tons which is safe.

If it is desired to use Gordon's formula, as given in the hand-books, it will be found that the heavier section will be required. $S=\dfrac{12{,}500}{1+\dfrac{(12L)^2}{36{,}000r^2}}$. $L=14$ and $r^2=16.4$, so $S=\dfrac{12{,}500}{1+\dfrac{(168)^2}{36{,}000\times16.4}}=\dfrac{12{,}500}{1.048}=11{,}920$. The area being 51.5 square inches, the strength of the section is $11{,}920\times51.5=615{,}000$ pounds or 307 tons.

In the Cambria hand-book safe loads are given in thousands of pounds for various column sections. The plate and channels columns found in the tables have plates varying in thickness from ¼" to ⅝" or from ⅜" to ¾". In no case is there a heavy enough section having twelve-inch, forty-pound channels and fourteen inch plates to carry the 300 ton load. By proportion, however, it is possible to check the result given above.

From the tables—page 270 in the 1909 edition of Cambria—it can be found that a column having a section made of two twelve-inch, forty-pound channels, two $\frac{1}{4}\times14''$ plates, and having a clear height of fourteen feet, will support a load of 365,000 pounds. The same section having $\frac{1}{2}''\times14''$ plates will support a load of

448,000 pounds. The addition of ¼" to the plates will give an increase of supporting power of 83,000 pounds. If this is true, an increase of ½" would give an increased supporting value of 166,000 pounds. If the section having ½" plates will support 448,000 pounds a section having 1" plates will support 448,000+166,000=614,000 pounds or 307 tons. This checks with the results given above, but as this method is extremely rough, it should only be used in checking.

The values given in the hand-books for safe loads on columns do very well for light loads, but when heavy loads are encountered and the area of the column is limited, it is necessary to figure the sizes of the members in the cross section. However, if there were no limit, the sizes can be taken directly from the hand-books. It will be found that a column composed of two 15" channels, weighing 45 pounds per foot, and two 17" x $\frac{11}{16}$" plates will support a load of 606,000 pounds for a clear height of 14 feet. Gordon's formula, as used in all these cases, gives a heavier section than is absolutely necessary and the New York Building Code formula gives more economical results.

In the cases mentioned in this article, plate and channel columns alone have been used. This is done because for a beginner the section given by the use of plates and channels has several advantages. It is almost a square section and therefore can be turned in such a direction as will suit the architectural requirements, without materially affecting the design. The riveting of plate and channel columns is very simple and connections are made easily.

Columns are fabricated in two story lengths. The advantages of this practice are obvious—the frame of the building is made stiffer and the fabrication and erection is simplified. The loading on the column increases at each floor, and engineers usually figure the size of each two-story length so that it will withstand the heaviest load coming upon it. If the architect has a column schedule in his office, it would be well for him to consult this, noticing the loads brought to each column, the heights of each length, and the areas of the sections.

In skeleton steel construction, the columns bring the loads of the building down to the foundations. Usually these loads are distributed over the foundations by means of grillage beams and the determination of the sizes of grillage beams will be taken up in the next article.

# THE YOUNG ARCHITECT

BY J. H. WELLS.

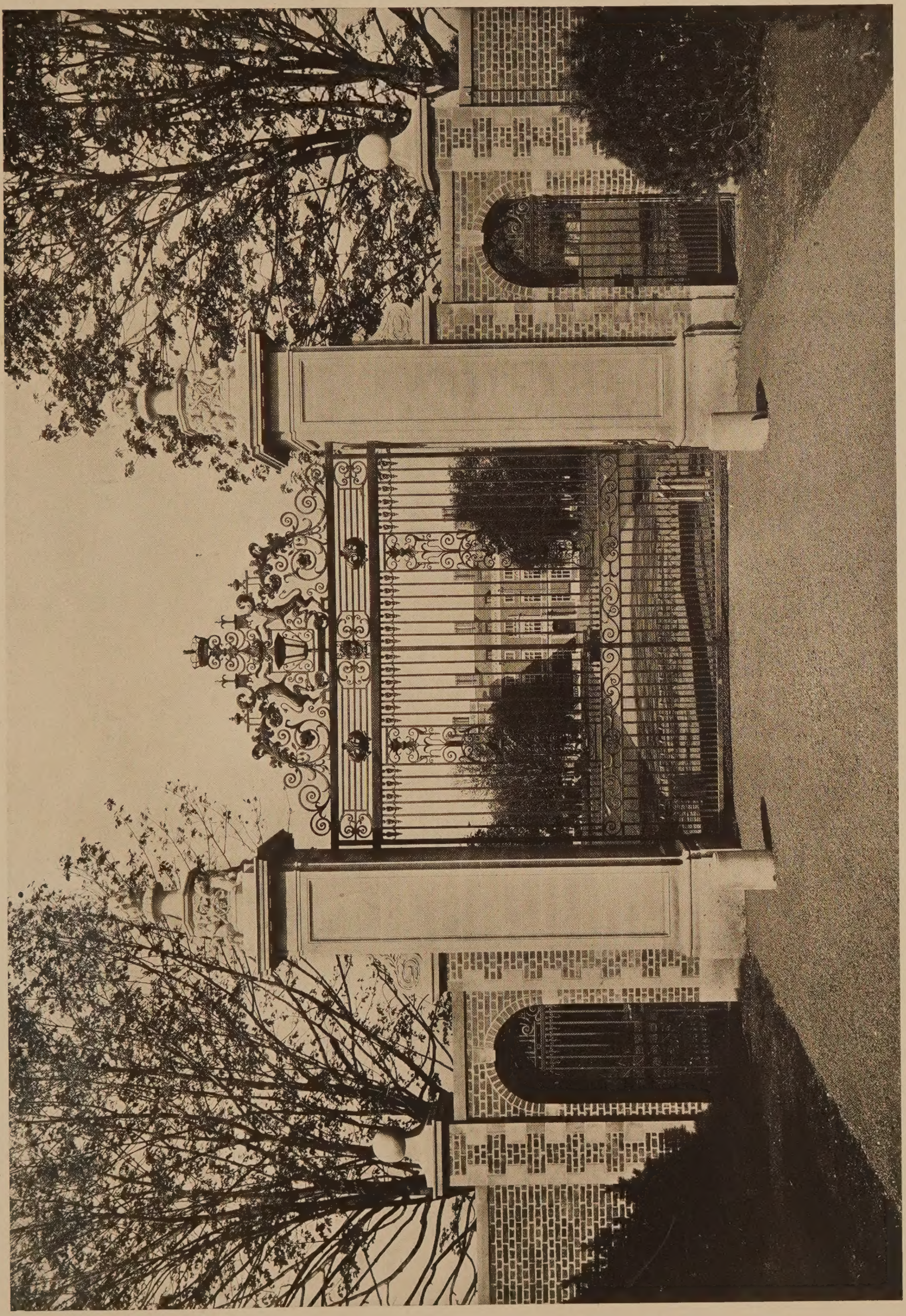
Some specifications are slipshod, the architect being stronger in art than in building construction. Contractors soon get to know these facts and this knowledge influences their bids.

IN the early days of an architect's career he is not infrequently pulled up short by his client with the question, "What will it cost?"—referring, of course, to the design, which, after many days' consideration, is now ready for the builder's hands. To answer this question to the satisfaction of an outsider would demand a thorough acquaintance on the part of the architect with the value of the labor and materials involved in all the building trades; but by some behind the scenes such knowledge is deemed wholly unnecessary, and the information is arrived at by the ready and convenient way known as "cubing." It is well to note at the outset that this method is not applicable to alterations, repairs, or restorations of any kind. When it is desired to know the cost of these, application must be made to a practical man. We have said that cubing is ready and convenient—first, because it can be promptly applied, the calculations involved being few; and, secondly, because the subtraction of a penny or two per cube foot will often bring the estimate within the required limits, and so satisfy the architect and client—for the time—although the prescribed limits may be considerably exceeded in carrying out the work.

There still evidently survives a fond belief that the architect's estimate must be the actual value of the work, for not otherwise can one account for the publication of the amount of the architect's estimate with a long list of tenders. Every tender must be an approximate estimate of the work to be done, and that which is nearest the actual value of the work is necessarily that prepared by a practical man who is acquainted not only with the value of building-work in general, but also with that of the locality in which the proposed building is to be erected. Some architects write rather sharp specifications, and they keep the contractors up to their provisions. Some specifications are slip-shod, the architect being stronger in art than in building-construction. Contractors soon get to know these facts, and this knowledge influences their bids. Builders, again, have varying moods when doing their work. Some are given to interpret the drawings and specifications generously, while others appear incapable of understanding the plain English of the specification clauses, and they always take them to mean something much easier of execution than was intended. It is as great a pleasure for an architect to have to deal with the former kind of contractor as it is a misery to wrestle with the latter.

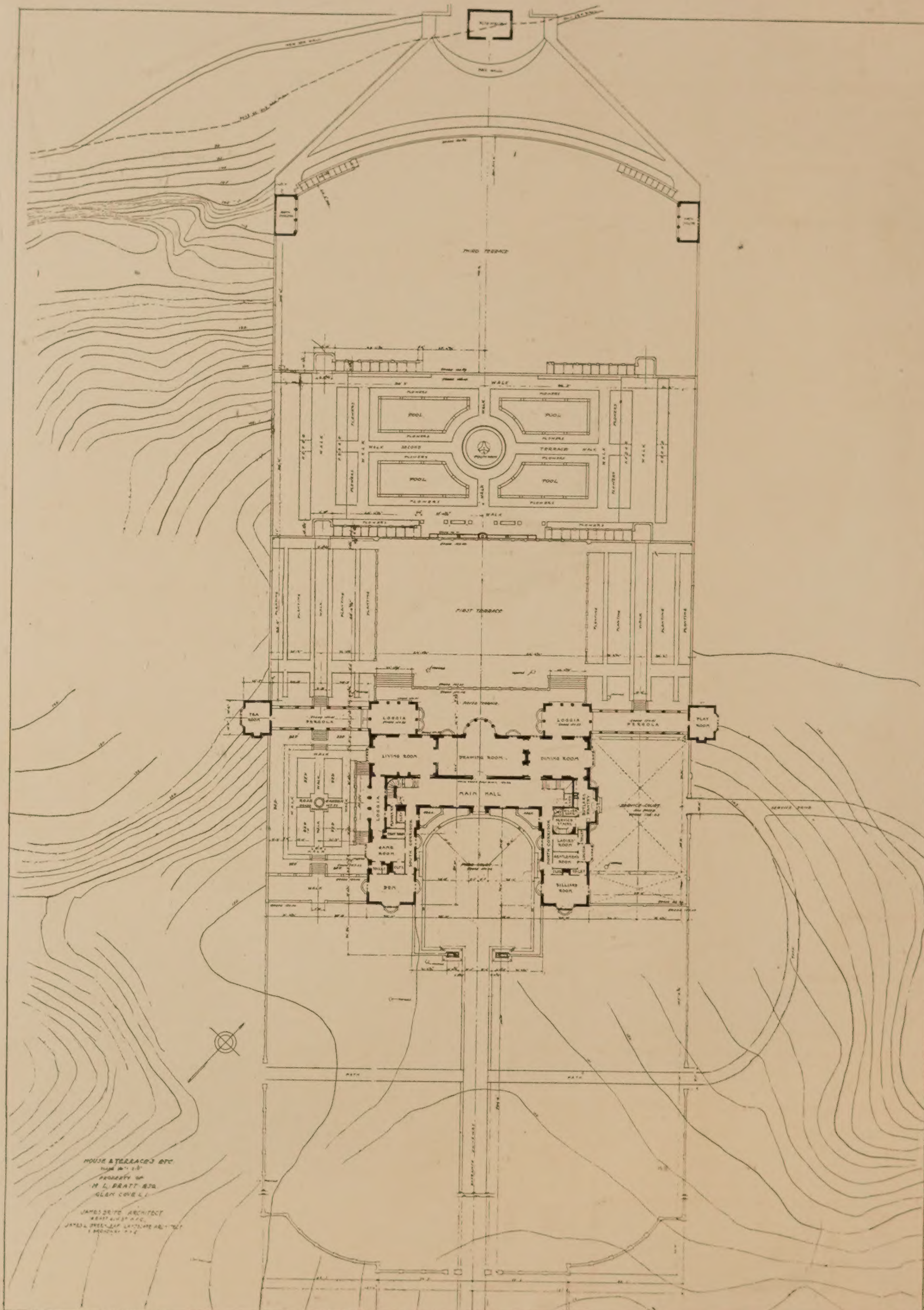
Having got over his first estimating, the architect's next difficulty will be in issuing his certificate for payments on account. This certainly demands some knowledge of the price of work, for the contract provides that the amount shall be a certain percentage of the value of the work done. But even in these cases certificates may be issued without any strict relation to the actual value thereof—at the beginning, at any rate; but towards the close the pinch is felt, and the architect must walk warily as the work is coming to a finish. Where an alteration is made in the work contracted for, the architect is supposed to estimate its value, and add to or deduct from the contract sum accordingly. But as the contractor has a vital interest in such changes, the architect is not likely to be left very long without some idea being obtained of what the builder values the change at. In our practice we found it difficult to get the contractor, in some cases, to say what the "extra" was worth, while in other instances the cost of the proposed change was stated at once. We would advise the architect to get an estimate at once of any such alteration and submit it to his client. The client's approval should be communicated in writing to the builder, and in this way, as the work proceeds, any additional cost will become part of the contract, and nothing will be left hanging over to the end

(Continued page 263)



ENTRANCE TO FORECOURT, COUNTRY HOUSE, HERBERT LEE PRATT, GLEN COVE, L. I.

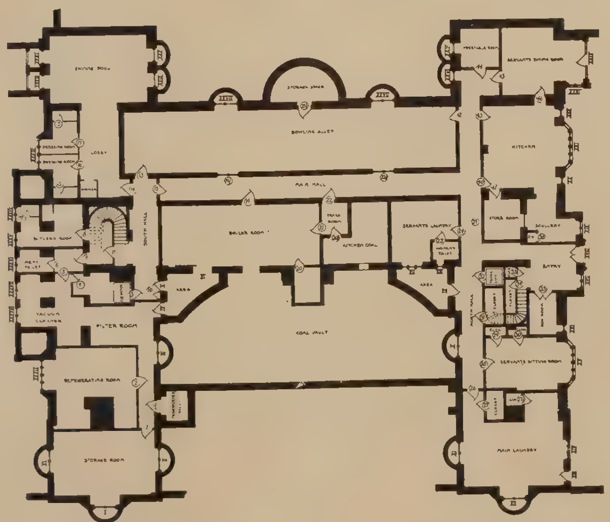
James Brite, Architect.




GROUND AND FIRST FLOOR PLAN, COUNTRY HOUSE, HERBERT LEE PRATT, GLEN COVE, L. I. James Brite, Architect.

Third Floor Plan.

Second Floor Plan.



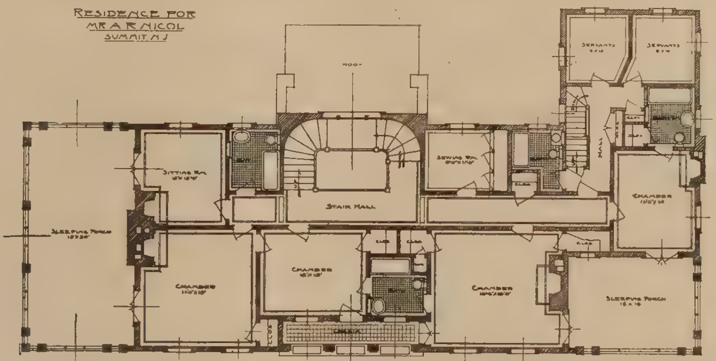
Basement Plan.

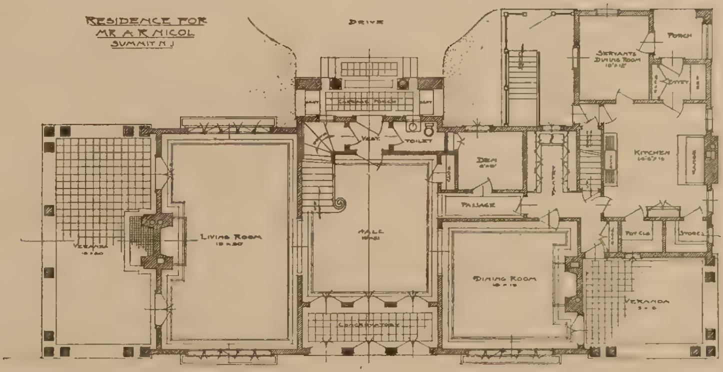
PLANS, COUNTRY HOUSE, HERBERT LEE PRATT, GLEN COVE, L. I.

James Brite, Architect.

COUNTRY HOUSE, A. R. NICOL, SUMMIT, N. J.

Wm. Allen Balch and L. S. Beardsley, Architects.




STABLE AND PLANS, COUNTRY HOUSE, A. R. NICOL, SUMMIT, N. J. Wm. Allen Balch and L. S. Beardsley, Architects.

DETAILS, COUNTRY HOUSE, A. R. NICOL, SUMMIT, N. J.

Wm. Allen Balch and L. S. Beardsley, Architects.

(Continued from page 256)

unsettled—a plan which satisfies nobody but the builder, and very often loses a client to the architect.

There is the possibility of an architect dispensing with a contractor, and carrying out his work with a clever foreman. In this case, all the money for wages and material will pass through the architect's hands; but, after a lengthened experience of this method, we cannot recommend it, and we strongly advise the architect to decline all money dealings if he wishes to maintain his independence and the respect of his client. We have taken a client to a lumber yard and, in his presence, bargained for what was necessary, the client paying there and then the amount of the account, everything being above board; but, years after, we heard that a slanderer suggested there was a private understanding in the case, and he was believed. In another case, we selected some gun-metal and brass-work in the presence of a client, and when the account was made out to us, showing plainly the discount, we handed it to the client, who discharged it with his cheque. But he was never satisfied that there was not some secret understanding between the merchant and ourselves giving us a further discount or commission. For years we have resolutely refused to purchase lighting fixtures, locks, or fittings of any kind that may be required in our buildings. Such a duty is the contractor's, and the profits of it should be left to him. It is no part of an architect's duty to turn tradesman.

# ENGINEERING IN A NEW FIELD

R. G. BULLOCH

THERE has been during the past decade so marked a development in the building trades and allied manufacturing interests that the architect, even though he be most versatile in the practice of his profession, cannot carry out the construction of the larger buildings without calling to his aid the services of various specialists, viz., structural engineers, heating and ventilating engineers, sanitary engineers, electrical and mechanical engineers who all have their complicated problems to solve, the details of which are so varied and intricate that it is impossible for the individual to meet them successfully.

The designing of the interior equipment of our commercial offices, banks and municipal buildings, has up to the present time, except in a few instances, been more or less neglected and left in the hands of the various manufacturers who fabricate this sort of work. Considering the important place the equipment and arrangement of offices has in the transaction of every day business, it is too important a subject not to receive the very best consideration. Man builds primarily to house himself and those possessions which are most sacred and valuable to him. It must therefore be apparent that too much care and study cannot be given to this important necessity with which he daily comes in closest contact. With this fact in mind, the equipment engineer has entered the field to lend his services to the owner and the architect and assist them in laying out and supervising the construction of such work as ordinarily comes under this heading.

The equipment engineer, to successfully serve his clients, must be well equipped to study the problems submitted to him, first from a view-point of economy and efficiency. It is therefore necessary that he be conversant with the conduct of business of every nature, whether it be banking, insurance, railroading or the transaction of the affairs of our city, county, state or federal government. He must be in a position to advise the architect as to the requirements of different municipal, state and commercial offices, as the efficient arrangement of the floor plan depends wholly upon the placing of the equipment to be used, in order that there may be no lost space and that lost motion in the transaction of business so far as possible will be eliminated. Too often plans are made and the essential features as to exact requirements are overlooked with the result that floor space is inefficiently distributed. This could have been eliminated if an expert in this kind of work had been retained to give the architect the information on which to base his plans.

The information necessary to arrive at the exact requirements of a particular department in a business organization is by no means easily obtained because it is usually difficult for the average man to impart his ideas to another in such a way that they will not be misunderstood. If, however, the person receiving the information has made a specialty of this sort of work and through his experience and knowledge can forecast that which will be imparted to him, he will obtain accurate information and thereby readily eliminate the possibility of an unsatisfactory installation. In addition to an intimate knowledge of the various kinds of business with which he comes in contact, the equipment engineer must be well versed in the application of the different materials to the equipment which he has been retained to design. An intimate knowledge of all processes which enter into the fabrication of this sort of material must be his through practical experience whether the equipment to be designed is of wood, steel, bronze or marble. The foregoing is quite essential in order that he may readily discover any attempt on the part of an unscrupulous manufacturer to furnish an inferior article at a first class price. Satisfactory results can be obtained only through the most rigid inspection of materials at the manufacturer's plant.

In order that the owner or the architect may receive full value for the money to be expended, it is necessary that manufacturers bid on plans which have been made by an impartial party. Plans which are made by any particular manufacturer for other manufacturers to bid from, are usually made to fit the requirements of this particular manufacturer's factory, also his methods of estimating, giving him a decided advantage while all other manufacturers work to a disadvantage and are thereby obliged to make their bids higher than they otherwise would. It is therefore possible for the manufacturer who made the plans to increase his price knowing well that it is impossible for his competitors to place a low figure on the work with profit to themselves. His intimate knowledge of manufacturing methods enables the equipment engineer to make a tentative estimate for the work involved and thereby a client is assured that the contemplated equipment will not exceed the amount appropriated. This estimate can be established from preliminary drawings thereby saving the client not only the expense of a complete set of detailed drawings and specifications but

(Continued page 265)


YOUNG WOMEN'S CHRISTIAN ASSOCIATION, YONKERS, N. Y. Franklin B. Ware and Arthur Ware, Architects.

(Continued from page 263)

the time and trouble involved by getting bids and then finding that the amount of equipment laid out far exceeds the appropriation.

This new field in engineering has not been, up to the present time, given the consideration justly due it. The reason lies in the fact that the subject requires a special training which can only be had through an intimate knowledge of the manufacturing methods involved in the fabrication of this branch of the building trades and a schooling which can be gained only by a long acquaintance with the subject. We can assume, however, that eventually our technical schools and universities will include this subject in their curriculum. The subject is worthy of the most profound thought and study by all who are interested in the architectural and engineering field.

# HEATING AND VENTILATION

BY ALLEN HUBBARD

An Informal Talk to the members of the Engineering Society, Massachusetts Institute of Technology.

IT may be interesting to compare the old with the present methods of building-construction in this country, and to note the evolution. By "old" I mean dating back approximately fifty years. Of course, there were many architects in those days; but I should say that, as a rule, when an owner wished to construct a building he went to some reputable contractor in whom he had confidence, and said to him that he wished to build, stating the kind of building. The contractor would then do the designing, such as it was, buy the material and erect the building on what is known today as the "cost-plus basis"; that is, he would charge the owner a certain profit on top of the cost of his labor and material. Any mistakes made, of course, were charged up as labor and material.

As competition became keener it was found that this sort of arrangement did not always carry with it the proper degree of honor on the part of the contractors, so that the owner paid more for his building than he should have paid. This soon developed the fact that to employ a trustworthy and well-trained architect (who would draw plans and specifications, and get real competitive bids, and after the contract was awarded see that the contractor furnished exactly what he contracted to give) was the cheapest and most satisfactory method of building.

In those days, before plumbing, electric lighting, power, heating and ventilating, steel and concrete, elevators, etc., were considered necessities, an ordinary office building would consist simply of the proper arrangement of the rooms, each room having a fireplace with a flue, or simply a flue to which a stove-pipe could be attached, and possibly gas-piping for lighting purposes. That construction as compared with modern construction made the problem comparatively simple. As steam heating gradually came into use the architects absorbed as much of the knowledge of the subject as possible, but depended principally on contractors to make the layout of the apparatus. The method of procedure would be something like this:

Having settled the arrangement of rooms, the story heights, etc., the architect marked off a space in the basement for the heating-apparatus. If he was especially careful he would find out from some one the proper size chimney for the boiler, and have this designed with the building wall. He would then let the contract for the building, and the building work would soon start. As soon as he could get to it he would call in four or five heating-contractors, show them the drawings, and ask them each to submit a layout for the steam heating-apparatus. Sometimes he would give them blue-prints which they could take to their office and lay out the apparatus right on the blue-print, or they would trace the blue-prints in the architect's office and have a set of separate drawings made showing the layout. Each contractor would do this, putting in a price with his plans and specifications. Often there was not sufficient room, so that his layout was made to fit the space available and not really what ought to be. The architect and the owner would then consider the prices. Generally, the lowest price was the one they considered first; and if the contractor was a responsible one, or if they thought his price was sufficiently low so that they would be warranted in "taking a chance," they would award the contract to him without going far into details or considering the others. The contractors, knowing that the man who put in the lowest price would probably receive the job, made a very careful study of how to lay out the work in the cheapest manner possible, supplying the required radiators, and having the apparatus in condition so that they could fire it up and have the work accepted. To do this the contractor was obliged to figure on the cheapest grade of valves and the smallest-sized boiler that he dared take a chance on. As he was his own expert and presuming on the architect's lack, he did about as he pleased.

A great many contracts were carried out in this way, with the result that in the long run, while the owner saved something in the first cost, he many times more than made it up by being obliged to force his boiler to an uneconomical point year after year, and by having to pay for repairs on various parts of the apparatus, which, if first class, would have needed no repairs.

There was another loss which after a time came to be recognized by the contractors. If an architect invited five different contractors to make plans and specifications for the same apparatus, and only one was successful, the other four had wasted their time in doing the same work as the successful contractor, and were obliged to stand this overhead expense. In order to keep in business they were obliged to charge the loss onto some other job, so that the general public had to pay for this loss or the steam contractors would have had to go out of business. At this, practically every steam contractor was obliged to carry his own engineering force capable of laying out any kind of a plant. It was not uncommon for each of the contractors to spend $300 or $400 or $500 on a large job in making the competitive layout. Various methods were tried by the contractors to recoup themselves for this loss.

As time passed, however, and more engineers came into the field, the necessity for contractors to carry an engineering force who made competitive layouts for large buildings practically ceased; so that today, while contractors of course have in their employ competent engineers, as a rule their

(Continued page 267)

Exterior.

Reception Room.

Gymnasium

YOUNG WOMEN'S CHRISTIAN ASSOCIATION, YONKERS, N. Y

Franklin B. Ware and Arthur Ware, Architects.

(Continued from page 265)

time is spent on special work or in estimating on layouts made by specialists.

There can be no sharp line drawn between the old method just described and the custom of today. It is a matter of development. It is safe to say, however, that expert engineering in modern building construction has been recognized as a necessity, not only by the architectural profession, but also by the public to a certain extent. Nearly every one of the leading architects in the country, when he has a large building on hand, pursues the following course:

Having been appointed architect for the building, he takes up with the owner the question of agreements, especially if the building is a public one. A regular contract is drawn up which specifies just what the architect is to furnish, and what the owner is to do, and places responsibilities. It is not uncommon to have a clause in this contract that stipulates that the owner shall pay for the services of such outside expert engineers as may be necessary for the domestic engineering (including plumbing, heating, lighting, and possibly elevators and refrigeration work, also steel and concrete). It is generally stipulated that the architect shall have the appointment of the engineer. This is a wise arrangement, as it is absolutely necessary that the architect and the engineer shall work in perfect harmony. In fact, the engineer under these conditions becomes practically a part of the architect's office.

In cases where there is not a regular, formal contract between the architect and the owner the architect often tells the owner that it will be necessary for him to employ specialists on the heating and ventilating and the electrical work or such other engineering work as he does not care to assume responsibility for in his own office. In the past this sort of a statement from an architect has come as a surprise to the owner, and even today there are numbers of the smaller architects who have not yet made a sufficiently large reputation to have the nerve to tell this to an owner. However, my experience is that all of the larger architects in the country do this. The owner pays the regular commission to the engineers, and also pays to the architect a commission on that part of the work taken care of by the engineers. This commission at the present time varies somewhat; roughly speaking, however, it is my opinion that 2½% of the cost of the work taken care of by the engineers is a reasonable percentage in most cases to cover the cost to the architect of the work which he has had to furnish in connection with the engineer's work. (Engineer ought not to take part of the architect's commission.)

Having settled with the owner that he (the owner) will furnish and pay the special engineer, the architect usually employs the man he prefers. The work then proceeds as follows: After the architect has blocked out on 16th or 8th scale (in very rare cases 32d scale) the building plan and elevation, the engineer goes over the matter with him and makes a rough calculation of the size of the boilers and the amount of power required, and gives the architect the size of space which will be necessary for boilers and engine-room, size of chimney; and, if it is a building where large amounts of air will be necessary for ventilation, the engineer gives the architect a rough idea of the space required for primary heaters, fans, air-washers, etc., also some rule for determining roughly the size of the flues for various rooms, and possibly general locations. With this data, the architect proceeds to draw his working scale-drawings. There are many matters which have to be considered during this process. We often go to an architect's office, trace off his unfinished plans, and from these tracings, in our own office, lay out as carefully as possible the sizes of radiators, ducts, location of pipes and various other parts of the apparatus; and after taking blue-prints, give this data to the architect, of which he can incorporate in his own drawings as much as he considers necessary.

After the architect's drawings are completed the engineer is able to make complete, accurate tracings of them and lay out carefully in detail all parts of the apparatus. Then the engineer draws up his specifications and obtains figures. You will see by this method that instead of the apparatus having to be crammed into spaces which are too small, and worked in around corners in such a way that it seriously hampers the operation of the plant, if the engineer has worked in harmony with the architect proper spaces have been provided in the building construction for the entire apparatus, so that if there is any failure it is because the engineer has not properly done his work. If the work has been properly done the apparatus is a source of satisfaction.

The bids received on a layout of this kind will all be based on identically the same apparatus, so that it becomes a question of which contractor has the best business organization and looks after his workmen to the best advantage.

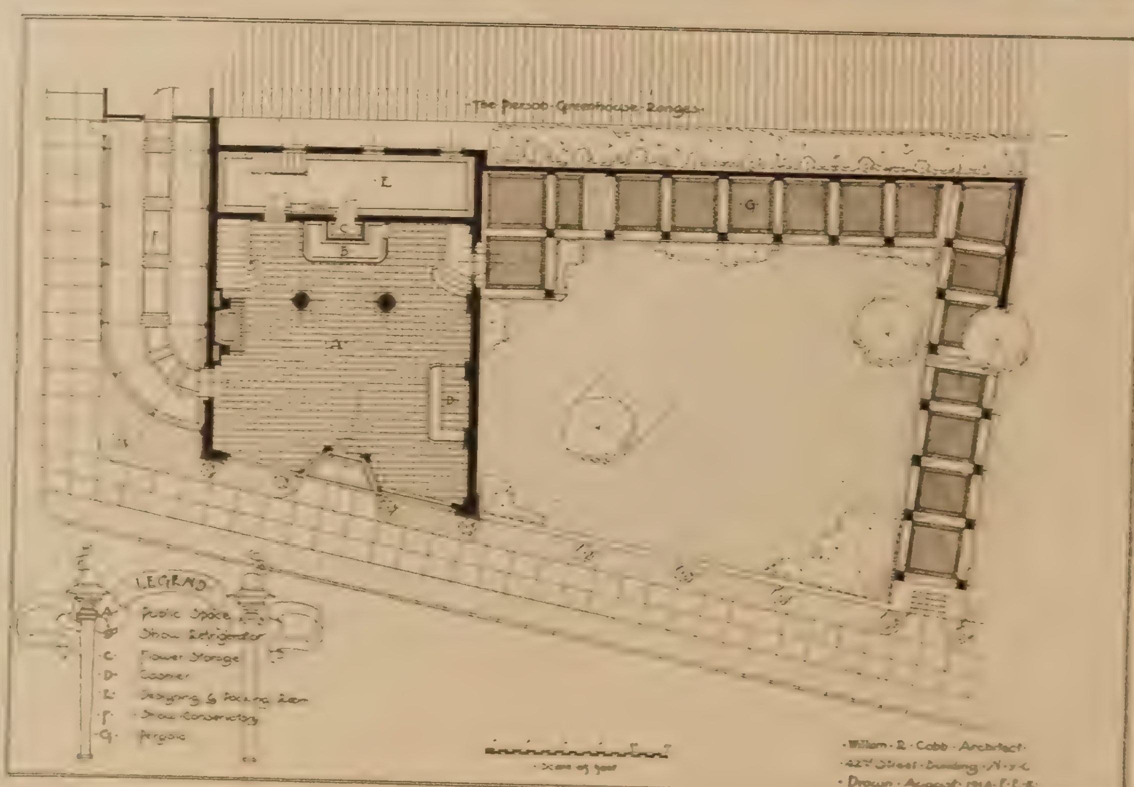
The owner can safely sign a contract with the lowest bidder, because there can be no misunderstanding in a properly drawn specification as to just what is to be furnished. It is assumed, of course, that the engineer has consulted with the architect and the owner as to just what results are to be accomplished in the building, and it is assumed also that the engineer is sufficiently skilled to be able to lay out the plant in the most reasonable, practical, and economical manner. When the work is being installed the engineer must look after it carefully, and see that it is installed in accordance with the intention of the drawings and specifications. No matter how carefully a heating and ventilating system may be planned and specified, there is always more than one way to install the parts of the apparatus. It is "up to" the engineer's superintendent to see that the best way is adopted.

For several years I acted as engineer for a contractor. I saw plants installed by our own firm and I saw plants which were installed by other people. I learned that no matter how well a system might be laid out, unless it was installed in accordance with the properly prepared drawings there was sure to be trouble.

A heating-apparatus is somewhat like a watch. It runs smoothly and keeps good time; it is unreliable and does not keep good time. This is most annoying. It is the same with a heating-apparatus: it either runs along smoothly and does its work, or it runs along with a snapping, cracking, and gurgling, and does not do proper heating, which, as in the case of the watch, is very annoying and something must be done.

So much depends upon the careful installation of a heating-apparatus that we have made it a practice to make no layouts and to write no specifications for work to be installed by others over which we do not have complete charge during installation. The mere fact that an engineer is connected with a job causes him to be blamed if anything goes wrong, regardless of the fact that he may not have supervised the installation and may not be really at fault.

(Continued page 270)




STORE AND OFFICES, F. R. PIERSON CO., TARRYTOWN, N. Y. — Wm. R. Cobb, Architect.

INTERIOR, STORE AND OFFICES, F. R. PIERSON CO., TARRYTOWN, N. Y.

Wm. R. Cobb, Architect.

*(Continued from page 267)*

Such blame, of course, hurts the engineer's reputation even though undeserved.

I might go on further and give you the details of how the work is checked up, extra orders and credits attended to, and how certificates of payment are made out. These are details, however, which it does not seem necessary to go into. The above gives you a general idea of the methods pursued when the heating engineer is employed with the architect. In a good many pieces of work the engineer is employed directly by the owner, such as rearranging old work or putting entirely new plants into old buildings. In this case the engineer, of course, treats only with the owner, and acts very much in the same capacity as the architect does for a new building.

I wish to say a word to you concerning the relation of these three parties. I have shown that the architect should determine the selection of the engineer for his buildings. I also stated that the engineer really becomes a part of the architect's office. You can readily see that with the engineer's work forming, as it does, an essential part of the building-construction, in order for the architect to get the best results he must have entire charge of the design. It often happens that what the engineer desires and would like best seriously interferes with the effect which the architect is after. In this case a compromise is usually effected which will give the best results to the owner.

It is important that a careful line be drawn, or rather a careful understanding exist, between the architect and the engineer as to just what parts of the work the architect is to embody in his specifications, and just what parts the engineer is to attend to, so that there will be no hiatus between the two; in other words, there will be no part of the work which each expects the other to do and which, consequently, is unprovided for. Take for an example the matter of painting on pipe-covering. This must be carefully understood as to whether the architect will specify the general contractor to do all painting, including the painting of the pipe-covering, or whether this is to be covered in the heating-contractor's specification: whether the foundation for the boiler is to be furnished by the general contractor or by the building-contractor. In case of a misunderstanding and an omission from both specifications the result is an extra payment which has to be "put up" to the owner. He, supposing that the contracts covered all such matters, is naturally "peeved." The owner may be nice about this or he may not be, depending on the character of the man; but the fact remains in either case that an omission has been made, and it does not help either the architect or the engineer.

In working up plans and specifications with an architect we have a regular list of forty or fifty items which cover all of the usual items which may be provided by the architect or the engineer. We give this list to the architect in duplicate, and ask him to fill out the two, designating what items he will take care of, etc.; he then keeps one copy for himself and returns the other to us. This arrangement has in the past saved a great many disputes between the architect and ourselves, and has settled a great many, so that the responsibility was placed just where it belonged. Another advantage of this list is that it brings to the attention of the architect in a forcible manner, as well as to our own attention, the fact that these various matters must be determined and provided for in the specifications.

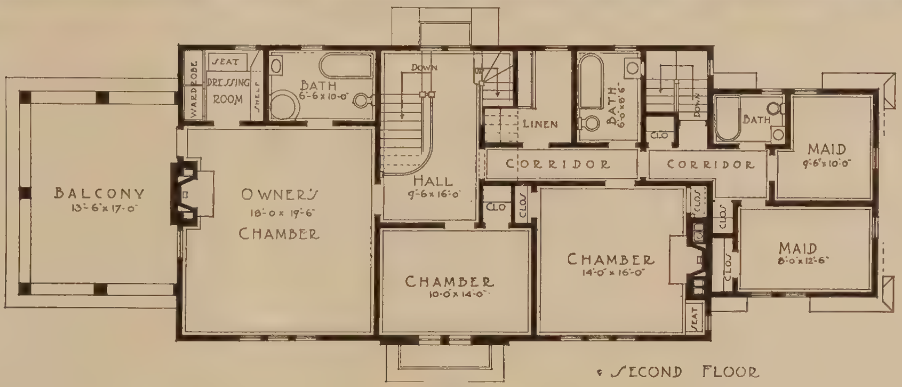
Human nature is the same the world over; every man in business today—at least, this is my observation—takes steps to put the responsibility wherever possible onto others, so that if any particular thing goes wrong he himself will not be held responsible. Architects and engineers are no exception to this rule, and unless one can show beyond question that he is not responsible when things go wrong he will have to shoulder the blame, and often the expense.

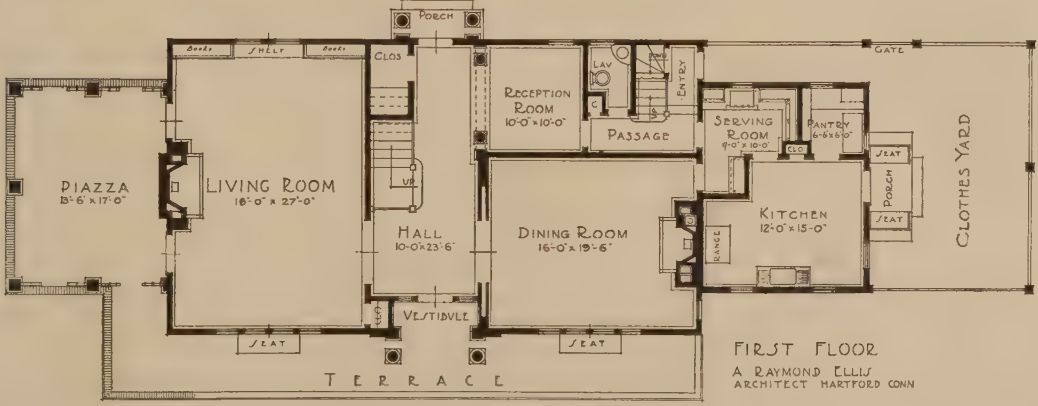
The necessity for carefully drawing plans and specifications was never greater than at the present time. As stated above, the contractors who figure on an engineer's plans and specifications are competing in earnest. They have definite quantities of material and labor to furnish, and consequently, if they figure to take the job at a low price they do not have very much leeway. The result is that during the progress of work, if omissions or errors appear, the contractor simply says to the engineer, "That is not called for on the plans, and my price will be so much extra for doing it." If this is a clear oversight on the part of the engineer he is in an awkward position. The contractor, in such a case, of course, is free from responsibility, and, like the architect and the engineer, he does all that he reasonably can to keep clear.

All this goes to show that the heating and ventilating engineer, in order to be successful, must have a thorough knowledge of his subject. He must be careful in making his calculations; he must have a large experience before he will be able to satisfactorily pass judgment on the various matters that will come up. Right here I wish to say that accuracy is one of the essentials which is overlooked in teaching boys in the lower grades, and in college as well. I have had in my employ numbers of college graduates in which I could not place confidence for the simple reason that they did not realize the necessity of being accurate. I myself was in the same class when I graduated, and it was only after I had received several hard knocks that I learned my lesson.

When one gets into the business world he will find that almost universally the measure of success is the dollar, and one can be successful only by being accurate. If an employee's errors cost his employer money his value will be very much decreased. The same is true if one is his own boss. Consequently, training in being careful is absolutely essential.

One of the greatest helps in successful heating and ventilating engineering is a broad knowledge, which must come largely from experience, not only in sizing up matters pertaining strictly to heating and ventilating, but also in general building-construction and engineering questions. Common sense and judgment all have for their foundation a knowledge of general things, and this knowledge must be more or less accurate. In making calculations for heating and ventilating you will find that there are a great many things to be taken into account besides the actual tables and rules which will be learned in school. By this I mean, for one thing, that no matter how carefully your calculations may be made, or how accurate they may be, if a building is carelessly built, windows badly fitted, or the building used in a different manner from what it was planned for, the heating and ventilating may not be satisfactory. All this has to be taken into consideration.




HOUSE AND PLANS, W. C. CHENEY, SOUTH MANCHESTER, CONN. A. Raymond Ellis, Architect.

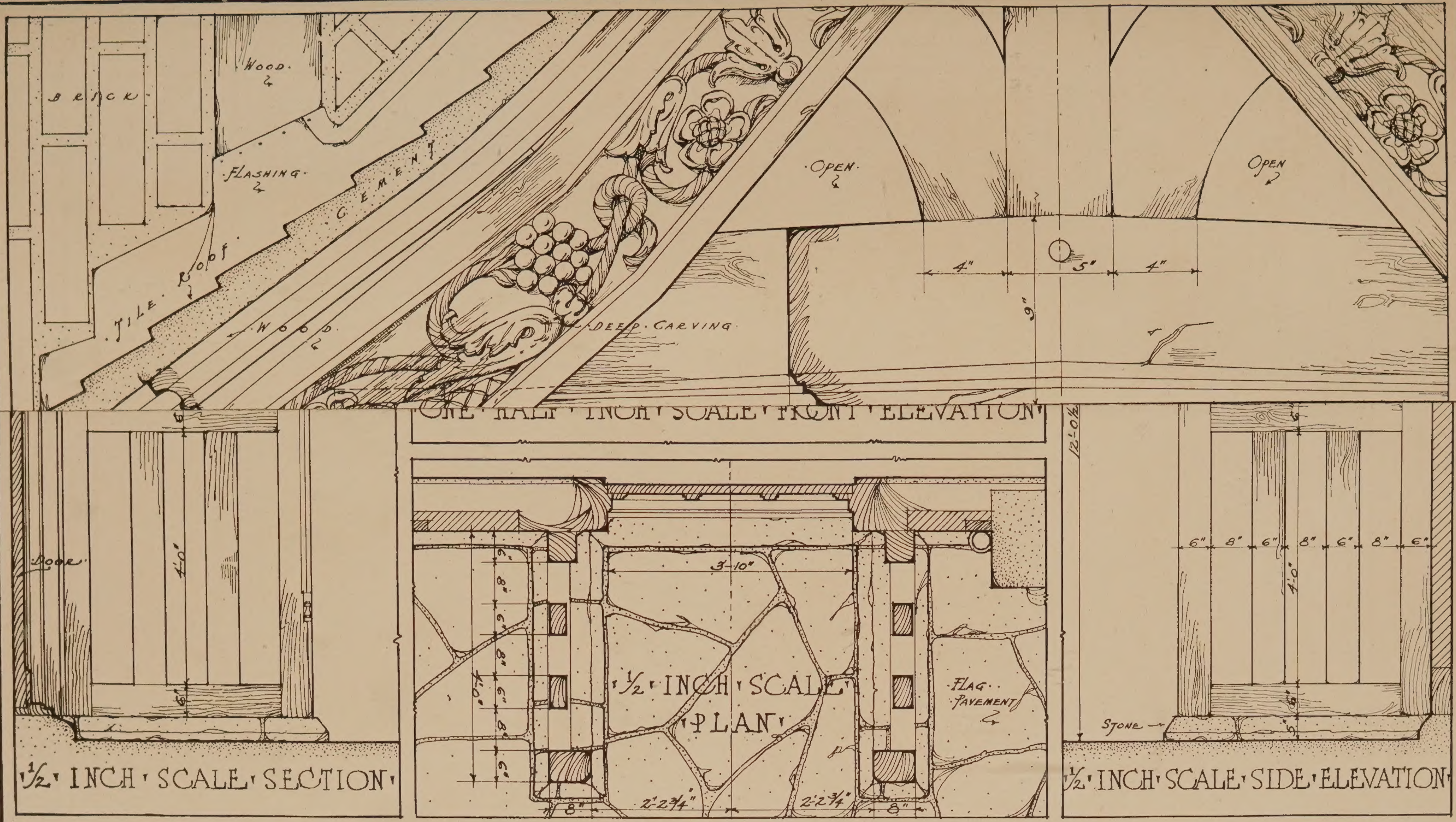
## BOOK REVIEW.

A Guide to Gothic Architecture. T. Francis Bumpers. 1914. Dodd, Mead & Co., New York. Cloth. $3.00 net.

The study of church architecture may be approached from so many sides, and possesses so many and varied sources of attraction, that we cannot wonder that persons of the greatest possible varieties of tastes and temperaments should be found at the present day to take a more or less lively interest in it. The wonder rather is that any age should be found indifferent to a subject which appeals in so many ways alike to our highest faculties and aspirations, and to our most ordinary moods and everyday habit of thought. No one in whom there lingers any feeling of association with the past—of delight in what is beautiful—of awe at what is lofty and sublime, or of reverence for that which enshrines and shadows forth holy things can really be indifferent to the charms of ecclesiastical architecture, and to call attention to any part of this wide subject is to open a book which all must read with delight, or take a pleasure in hearing read by others.

The history of church architecture, whether English or Continental, is so closely allied with the progress of civilization and the general history of the several countries which compose the map of Europe that it is impossible to understand the one without some knowledge of the other.

This book will prove a valuable addition to the architect's library.




"ARCHITECTVRE" SERIES OF MEASVRED DETAILS

OLD ENGLISH DOORWAY RESET
RESIDENCE AT OSSINING N Y
CARETTO & FORSTER ARCHTS N Y C

DRAWING NO 30
DECEMBER 1914
DRAWN BY WALTER McQVADE


THE EDISON SHOP, 473 FIFTH AVE., NEW YORK.

SHAPE & BREADY, INC., ARCHITECTS.